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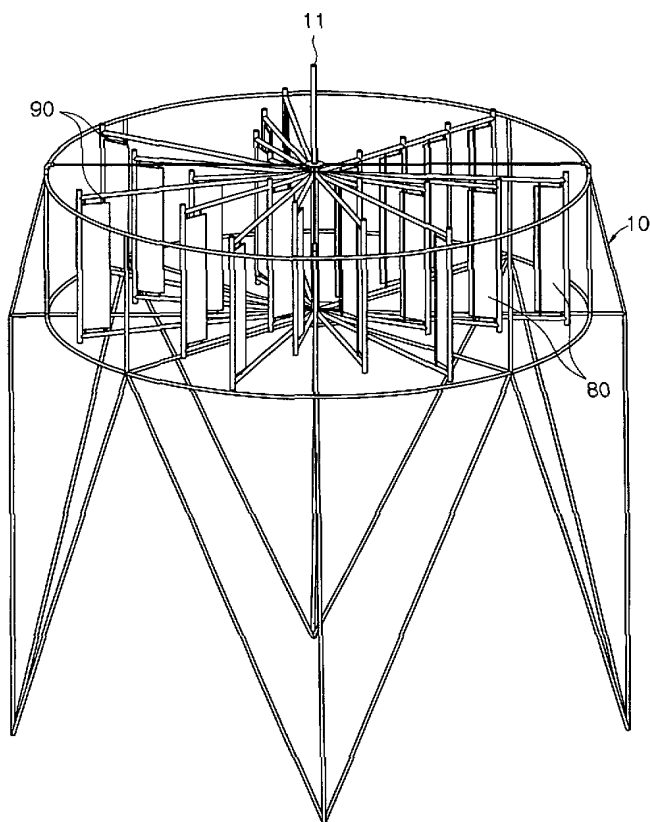
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(54) Title: MULTI-DIRECTIONAL WIND POWER GENERATOR



(57) Abstract: The present invention relates to a wind power generator, and more particularly, to a multi-directional wind power generator capable of maximizing use efficiency of wind as well as enabling effective power generation regardless of the wind direction. The multi-directional wind power generator of the invention can generate electric power regardless of wind direction as well as minimize the resistance against the wind thereby enhancing its efficiency.



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## MULTI-DIRECTIONAL WIND POWER GENERATOR

### Technical Field

5           The present invention relates to a wind power generator, and more particularly, to a multi-directional wind power generator capable of maximizing the use of the wind as well as enabling effective power generation regardless of the wind direction.

### 10   Background Art

          In general, electric power generations can be classified into hydroelectric power generation using head drop of water, thermal power generation which obtains electric power by means of combustion of fuel, nuclear power generation using nuclear fission and wind power generation using wind. A proper power generator is  
15   established considering season and geographic influence to obtain electric power.

          Among these power generations, wind power generator produces electric power utilizing wind that is a kind of natural phenomena, and has advantages in that installation cost is inexpensive unlike other power generating plants and power generation can be performed individually in the unit of home or local community.

20           Fig. 8 is a front elevation view of a conventional wind power generator.

          As shown in Fig. 8, the conventional wind power generator includes blades 501 that rotate by wind, a generator 500 for generating electric power from the rotational force of the blades 501 and a support frame 600 for supporting the generator 500 and the blades 501.

25           The above wind power generator is provided with the radial blades each having a predetermined length from a rotary shaft thereof. When wind collides

against each rotary blade to rotate the rotary blade, a portion of the rotary blade obstructs rotation of the rotary blade resulting from its weight. The rotation distance of the rotary blade becomes different as it travels from one end of each of the rotary  
5 blades to the other end. Thus, in the integral rotary blades rotating with an equal angle, the rotation power of the rotary blades is counterbalanced thereby decreasing the efficiency of the wind power generator.

Further, the rotary blades can rotate only when the wind collides against the front of the rotary blades. However, since the wind direction is not constant, a  
10 separate device is needed to turn the rotary blades according to the wind direction, causing inconvenience to manufacture.

### **Disclosure of the Invention**

The present invention has been made to solve the foregoing problems and it  
15 is therefore an object of the present invention to provide a multi-directional wind power generator that can generate electric power regardless of wind direction as well as minimize the resistance against the wind, thereby enhancing its efficiency.

According to an aspect of the invention, there is provided a multi-directional wind power generator comprising: a base frame having a central shaft and being  
20 supported on the ground, disposed around the central shaft defining a space of a predetermined radius; a first rotary shaft rotatably fitted around the central shaft of the base frame; a plurality of first upper/lower support frames extended from upper and lower outer peripheries of the first rotary shaft to a predetermined radius; first rotary blades hinged by their both ends, respectively, on distal ends of the first upper/lower  
25 support frames; first anti-pivoting bars disposed, respectively, at portions of the first upper/lower frames to prevent pivoting of the first rotary blades so that the first rotary

blades are oriented parallel with the first upper/lower support frames; first control means disposed respectively in the first upper/lower support frames for controlling pivoting of the first rotary blades; rotation power transmission means disposed  
5 around a lower portion of the central shaft of the base frame to transmit the rotation power of the first rotary shaft at a rotation rate changed via gear combination; and a generator for generating electric power under the rotation power transmitted from the rotation power transmission means.

Preferably, the multi-directional wind power generator of the invention may  
10 further comprise auxiliary rotary blades hinged by both ends, respectively, on the distal ends of the upper/lower support frames to rotate in the wind and auxiliary stopper protrusions formed, respectively, at the distal ends of the upper/lower frames to contact with one sides of the auxiliary rotary blades in pivoting of the auxiliary rotary blades.

15 In the multi-directional wind power generator of the invention, the pivoting-control means are wires that are fixed, respectively with one portion of the anti-pivoting bars and one portion of the rotary blades to regulate the rotation angle of the pivoting blades. Also, the pivoting-control means are stopper protrusions that are formed, respectively, at both sides of the distal ends of the upper/lower support  
20 frames to contact one side of the rotary blades in pivoting of the auxiliary rotary blades.

In the multi-directional wind power generator of the invention, the rotation power transmission means include a gear housing disposed around a lower portion of the central shaft and having an inner space, a female threaded portion projected  
25 downward from an underside of the gear housing to a predetermined height for receiving an adjustment bolt, a central shaft supporting member disposed on the

adjustment bolt for supporting the central shaft, a drive gear fitted around one end of the rotary shaft which is fitted around the central shaft and extended into the gear housing, a driven gear shaft having a driven gear meshed with the drive gear and  
5 rotating within the gear housing, a transmission gear disposed at an end of the driven gear shaft and extending through a bottom of the gear housing, and a generator gear meshed with the transmission gear for transmitting rotation power to the generator.

Preferably, the multi-directional wind power generator of the invention may further comprise first to third rotation shafts fitted around the first rotation shaft in the  
10 order of the first to third rotation shafts; a plurality of first to third upper/lower support frames extended, respectively, from upper and lower outer peripheries of the first to third rotary shafts to respective predetermined radii of rotation; first to third rotary blades hinged by their both ends, respectively, on distal ends of the first to third upper/lower support frames to rotate in the wind; first to third anti-pivoting bars  
15 disposed, respectively, at portions of the first to third upper/lower frames to prevent pivoting of the first to third rotary blades at respective positions; first to third control means disposed, respectively, on the first to third upper/lower support frames for controlling pivoting of the first to third rotary blades; first to third drive gears coupled, respectively, with one ends of the first to third rotation shafts extended into the gear  
20 housing; and first to third driven gears meshed, respectively, with the first to third drive gears at respective rotation rates.

In the multi-directional wind power generator of the invention, the upper/lower support frames and the anti-pivoting bars are preferably made of shape steels having V-shaped cross sections.

25 Further, in the multi-directional wind power generator of the invention, gear ratios of drive gears in respect to the driven gears are 2.5, 1.7, 1.25 and 1 in the order

of the drive gear to the driven gear, the second drive gear to the second driven gear, the third drive gear to the third driven gear and the fourth drive gear to the fourth driven gear.

5

### **Brief Description of the Drawings**

The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

10        Fig. 1 is a perspective view of a multi-directional wind power generator of the invention;

Fig. 2 is an exploded perspective view of the multi-directional wind power generator of the invention;

15        Fig. 3 is a longitudinal sectional view of the multi-directional wind power generator of the invention;

Fig. 4 is a cross-sectional view of the multi-directional wind power generator of the invention;

Fig. 5 is a perspective view of a part of the multi-directional wind power generator of the invention;

20        Fig. 6 is a perspective view of an alternative to rotary blades in the multi-directional wind power generator of the invention;

Fig. 7 is a perspective view of another alternative to rotary blades in the multi-directional wind power generator of the invention; and

Fig. 8 is a front elevation view of a conventional wind power generator.

25        <Description of symbols in main portions of the drawings>

10: Base frame

11: Central shaft

20: Gear case	30: Adjustment bolt
40: Female threaded portion	50: Central shaft supporting member
60: Rotary shaft	70: Upper/lower support frames
80: Rotary blades	90: Anti-pivoting bar
100: Wire	110: Drive gear
120: Driven gear 120	130: Driven gear shaft
140: Transmission gear	150: Generator gear
160: Generator	170: Stopper protrusion

### **Best Mode for Carrying out the Invention**

The following detailed description will present a multi-directional wind power generator of the invention in reference to the accompanying drawings.

Fig. 1 is a perspective view of a multi-directional wind power generator of the invention, Fig. 2 is an exploded perspective view of the multi-directional wind power generator of the invention, Fig. 3 is a longitudinal sectional view of the multi-directional wind power generator of the invention, Fig. 4 is a cross-sectional view of the multi-directional wind power generator of the invention, Fig. 5 is a perspective view of a part of the multi-directional wind power generator of the invention, Fig. 6 is a perspective view of an alternative to rotary blades in the multi-directional wind power generator of the invention, and Fig. 7 is a perspective view of another alternative to rotary blades in the multi-directional wind power generator of the invention.

As shown in Figs. 1 to 7, the multi-directional wind power generator of the invention comprises a central shaft 11 and a base frame 10 supported on the ground, disposed around the central shaft 11 defining a space of a predetermined radius.

A gear housing 20 is disposed in the base frame 10 around a lower portion of

the central shaft 11. A female threaded portion 40 is projected downward from the underside of the gear housing 20 to a predetermined height, an adjustment bolt 30 is meshed into the female threaded portion 40, and a central shaft supporting member  
5 50 is seated on the adjustment bolt 30 to perform point-to-point contact with the bottom of the central shaft 11 thereby supporting the same.

A rotary shaft 60 is rotatably fitted around the central shaft 11 of the base frame 10, and a plurality of upper/lower support frames 70 are extended from upper and lower outer peripheries of the rotary shaft 60 to a predetermined radius.

10 Their both ends hinge rotary blades 80, respectively, on distal ends of the upper/lower support frames 70 so that the rotary blades 80 can rotate in the wind.

Anti-pivoting bars 70 vertically connect between the upper and lower frames 70 at predetermined portions of the upper/lower frames 70 in order to prevent pivoting of the rotary blades 80 at a predetermined position.

15 Preferably, the upper/lower frames 70 and the anti-pivoting bars 90 are made of shape steel having a V-shaped cross section. Then, in addition to the rotary blades 80, the wind collides against the upper/lower frames and the anti-pivoting bars 90 to enhance torque.

A wire 100 fixedly connects between each anti-pivoting bar 90 and each  
20 rotary blade 80 to regulate the pivoting angle of the rotary blade 80.

Alternatively, stopper protrusions 170 are formed at both sides of distal ends of each upper/lower support frames 70 to regulate the pivoting angle of each rotary blade 80. During pivoting of the rotary blade 80, the stopper protrusions 170 contact one side of the rotary blade 80 to block pivoting of the rotary blade 80.

25 In addition to the stopper protrusions 170 blocking the rotary blade 80, it is preferred that the rotary blade 80 is extended beyond the distal ends of the



upper/lower support frames 70 to enlarge the area of the rotary blade 80 thereby increasing the effect of the wind.

Alternatively, an auxiliary rotary blade 80a is hinged by its both ends on distal  
5 ends of each upper/lower frames 70 adjacent to one end of each rotary blade 80, in  
which one side of the auxiliary rotary blade 80a is blocked by one side of the rotary  
blade 80 so that pivoting of the auxiliary blade 80a is stopped by the one side of the  
rotary blade 80. Also, auxiliary stopper protrusions 170a are formed at the distal  
ends of the upper/lower frames 70 to regulate the pivoting angle of the auxiliary rotary  
10 blade 80a.

The rotary shaft 60 is fitted around the central shaft 11, extended into the gear  
housing 20. A drive gear 110 is coupled with a lower end of the rotary shaft 60, and  
a driven gear 120 is meshed with the drive gear 110 within the gear housing 20.

A driven gear shaft 130 rotating within the gear housing 20 by the driven gear  
15 120 is extended through the underside of the gear housing 20. A lower end of the  
driven gear shaft 130 is coupled with a transmission gear 140, which is meshed with  
a generator gear 150 of a generator 160.

Preferably, first to third rotary shafts 60a, 60b and 60c are fitted around the  
rotary shaft 60 around the central shaft 11, and first to third upper/lower support  
20 frames 70a, 70b, 70c are extended, respectively, from upper and lower outer  
peripheries of the first to third rotary shafts 60a to 60c to predetermined radii.

Further, rotary blades 80 are hinged by their both ends, respectively, on distal  
ends of the first to third upper/lower frames 70a to 70c so that the rotary blades 80  
can rotate in the wind. Anti-pivoting bars 90 prevent pivoting of the rotary blades 80,  
25 respectively, at predetermined positions. A wire 100 fixedly connects between each  
anti-pivoting bar 90 and each rotary blade 80 to regulate the pivoting angle of the

rotary blade 80.

The second upper/lower support frames 70a are extended to a predetermined length and the rotary blades 80 attached to the second support frames 70a are placed on the equal height. The third upper/lower support frames 70b are extended to a predetermined length larger than that of the second support frames 70a and the rotary blades 80 attached to the third support frames are placed on the equal height. The fourth upper/lower support frames 70c are extended to a predetermined length larger than that of the third support frames 70b and the rotary blades 80 attached to the fourth support frames are placed on the equal height. As a result, the first to third upper/lower support frames 70a to 70c rotate on respective radii of rotation that are different from one another.

The first to third rotary shafts 60a to 60c are extended into the gear housing 20. First to third driving gears 110a, 110b and 110c are coupled, respectively, to lower ends of the first to third rotary shafts 60a to 60c, and the driven gear shaft 130 is also coupled with first to third driven gears 120a, 120b and 120c which are meshed, respectively with the first to third driving gears 110a to 110c.

With the invention of the above structure, the wind influences the plurality of blades connected to the wires that are fixed to the anti-pivoting bars.

Also, the blades can be influenced by the sea water or tide and thus the invention can be used for tidal powder generation.

Where the plurality of rotary blades are under the influence of the wind or the sea water, as the wind for example collides against one side of each rotary blade disposed in the outer periphery of each rotary shaft, the pertinent rotary blade, instead of pivoting, is supported by a corresponding anti-pivoting bar or bars.

As a result, the rotary blade turns the rotary shaft under the influence of the

wind.

Also, the rotary blade is fixed by one side to a corresponding wire fixed to the anti-pivoting bar to regulate the pivoting angle of the rotary blade.

5        According to alternatives of the invention, the stopper protrusions and the auxiliary stopper protrusions are provided to regulate the pivotal angle of the rotary blades. After the rotary blade pivot a predetermined angle, one side of a first one of the rotary blades is stopped by corresponding stopper protrusions disposed at distal ends of corresponding upper/lower frames. Also, each auxiliary blade is stopped by  
10       corresponding auxiliary stopper protrusions after pivoting a predetermined angle.

When the auxiliary rotary blade is under the influence of the wind, one sides of the corresponding auxiliary stopper protrusions contact one side of the auxiliary rotary blade preventing its pivoting so that the auxiliary rotary blade cooperates with the rotary blade to rotate the rotary shaft.

15       When the wind collides into a second one of the auxiliary rotary blades remote from the first rotary blade, the pertinent rotary blade pivots to avoid the influence of the wind as a corresponding anti-pivoting bar is placed in front of the rotary blade that is in the windward side.

As a result, in rotation of the rotary shaft where the first rotary blade rotates  
20       under the influence of the wind to add rotation power to the rotary shaft whereas the second rotary blade rotates against the wind, the second rotary blade pivots to avoid the influence of the wind without decreasing the rotation power of the rotary shaft so that the rotation power of the rotary shaft can be enhanced.

As shown in Fig. 1, the rotary shaft together with rotary blades rotates  
25       clockwise in the wind, wherein each rotary blade has a position angle of zero degree as the rotary blade is placed on the leeward of the rotary shaft. In the position angle

of about 0 to 180 degree, the rotary blade is greatly influenced by the wind and thus adds the rotation power of the rotary shaft. As passing by the position angle of about 180 degree, the rotary blade pivots by the wind.

5           In the position angle of about 180 to 270 degree, the rotary blade is inclined in respect to the direction of the wind so that the wind flows against the inclination of the rotary blade to reinforce the rotation power of the rotary shaft.

          In the position angle of about 270 to 360 degree, the rotary blade is oriented parallel with the direction of the wind and thus free from the influence of the wind  
10       without decreasing the rotation power of the rotary shaft.

          As a result, the rotary blade can generate rotation power from the wind in a range of about 0 to 270 degree so as to enhance the rotation power of the rotary shaft.

          As the rotary shaft rotates under the enhanced rotation power, the driving  
15       gear in the gear housing transmits the rotation power to the driven gear and then the driven gear shaft transmits the rotation power via the transmission gear to the generator so that the generator generates electric power.

          In the meantime, the first to third rotary shafts are fitted around the rotary shaft to enhance the rotation power of the rotary shaft.

20       Where the rotation power of the first to third rotary shafts is transmitted to the driven gear shaft within the gear housing, first to third driving gears are coupled, respectively, with lower ends of the first to third drive gear shafts. The driven gear shaft is coupled with the first to third driven gears that are meshed, respectively, with the first to third drive gears at different rotation rates.

25       Where the drive gears mesh respectively with the driven gears, the rotary shaft has the smallest radius of rotation whereas the fourth rotary shaft has the

largest radius of rotation. Preferably, gear ratios of drive gears in respect to the driven gears are 2.5, 1.7, 1.25 and 1 in the order of the drive gear to the driven gear, the second drive gear to the second driven gear, the third drive gear to the third  
5 driven gear and the fourth drive gear to the fourth driven gear.

### **Industrial Applicability**

As set forth above, the multi-directional wind power generator of the invention can generate electric power regardless of wind direction as well as minimize the  
10 resistance against the wind thereby enhancing its efficiency.

### Claims

1. A multi-directional wind power generator comprising:
- a base frame having a central shaft and being supported on the ground,
- 5 disposed around the central shaft defining a space of a predetermined radius;
- a first rotary shaft rotatably fitted around the central shaft of the base frame;
- a plurality of first upper/lower support frames extended from upper and lower outer peripheries of the first rotary shaft to a predetermined radius;
- first rotary blades hinged by their both ends, respectively, on distal ends of the
- 10 first upper/lower support frames;
- first anti-pivoting bars disposed, respectively, at portions of the first upper/lower frames to prevent pivoting of the first rotary blades so that the first rotary blades are oriented parallel with the first upper/lower support frames;
- first control means disposed respectively in the first upper/lower support
- 15 frames for controlling pivoting of the first rotary blades;
- rotation power transmission means disposed around a lower portion of the central shaft of the base frame to transmit the rotation power of the first rotary shaft at a rotation rate changed via gear combination; and
- a generator for generating electric power under the rotation power transmitted
- 20 from the rotation power transmission means.

2. The multi-directional wind power generator of claim 1, further comprising:
- first to third rotation shafts fitted around the first rotation shaft in the order of the first to third rotation shafts;
- 25 a plurality of first to third upper/lower support frames extended, respectively,

from upper and lower outer peripheries of the first to third rotary shafts to respective predetermined radii of rotation;

first to third rotary blades hinged by their both ends, respectively, on distal  
5 ends of the first to third upper/lower support frames to rotate in the wind;

first to third anti-pivoting bars disposed, respectively, at portions of the first to third upper/lower frames to prevent pivoting of the first to third rotary blades at respective positions;

first to third control means disposed, respectively, on the first to third  
10 upper/lower support frames for controlling pivoting of the first to third rotary blades;

first to third drive gears coupled, respectively, with one ends of the first to third rotation shafts extended into the gear housing; and

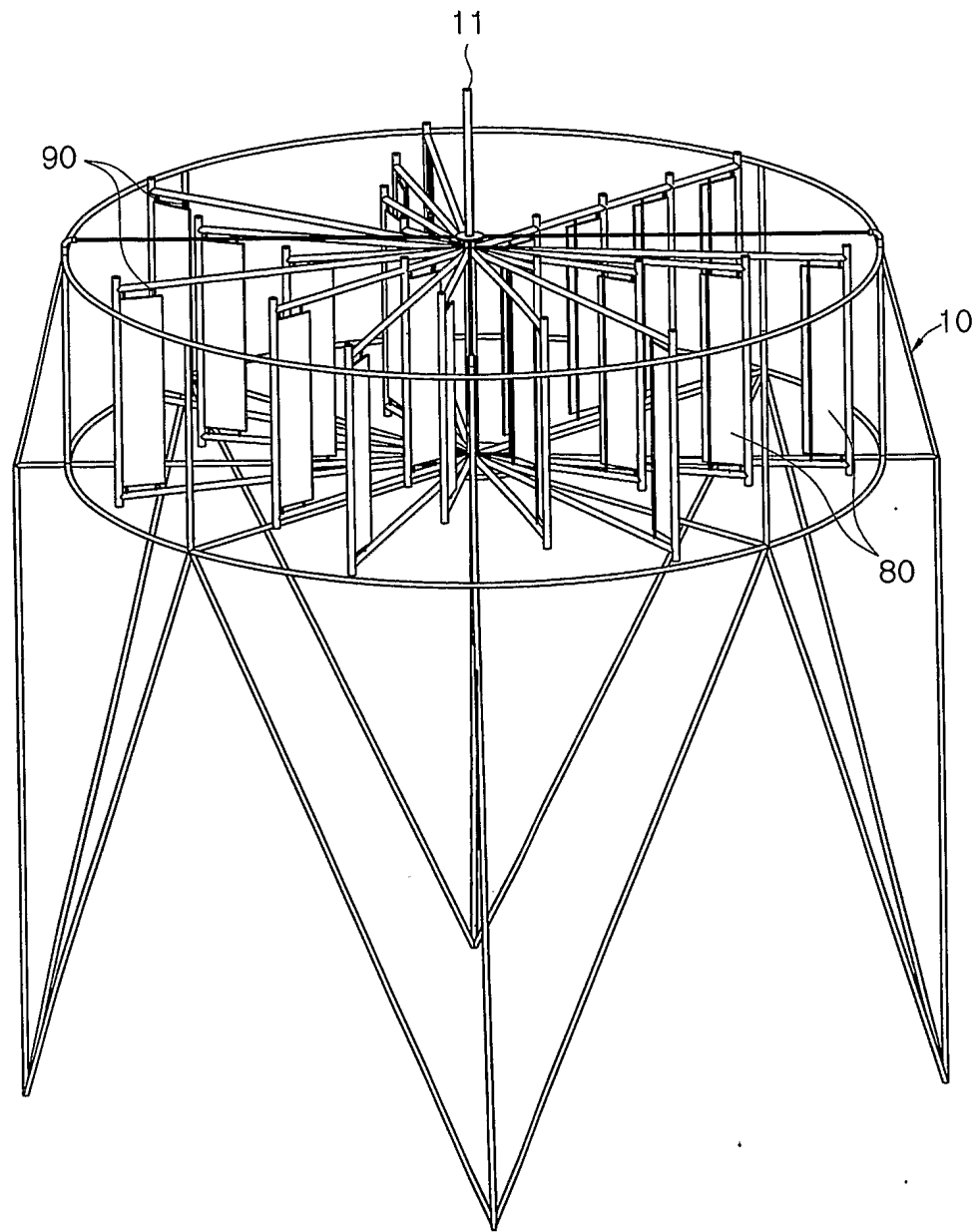
first to third driven gears meshed, respectively, with the first to third drive gears at respective rotation rates.

15

3. The multi-directional wind power generator of claim 1 or 2, wherein the first to fourth pivoting-control means are stopper protrusions which are formed, respectively, at both sides of one ends of the first to fourth upper/lower support frames to contact, respectively, one sides of the first to fourth rotary blades.

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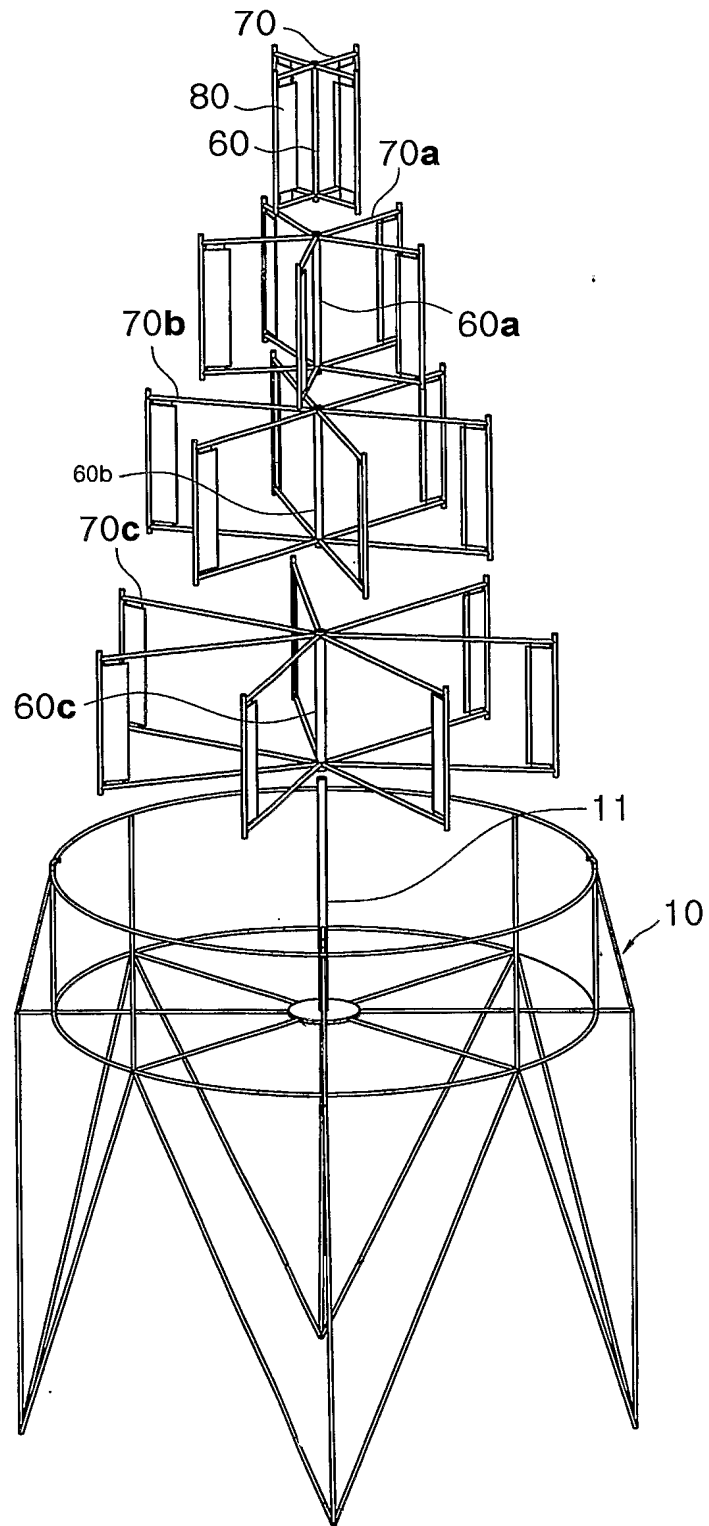
FIG. 1





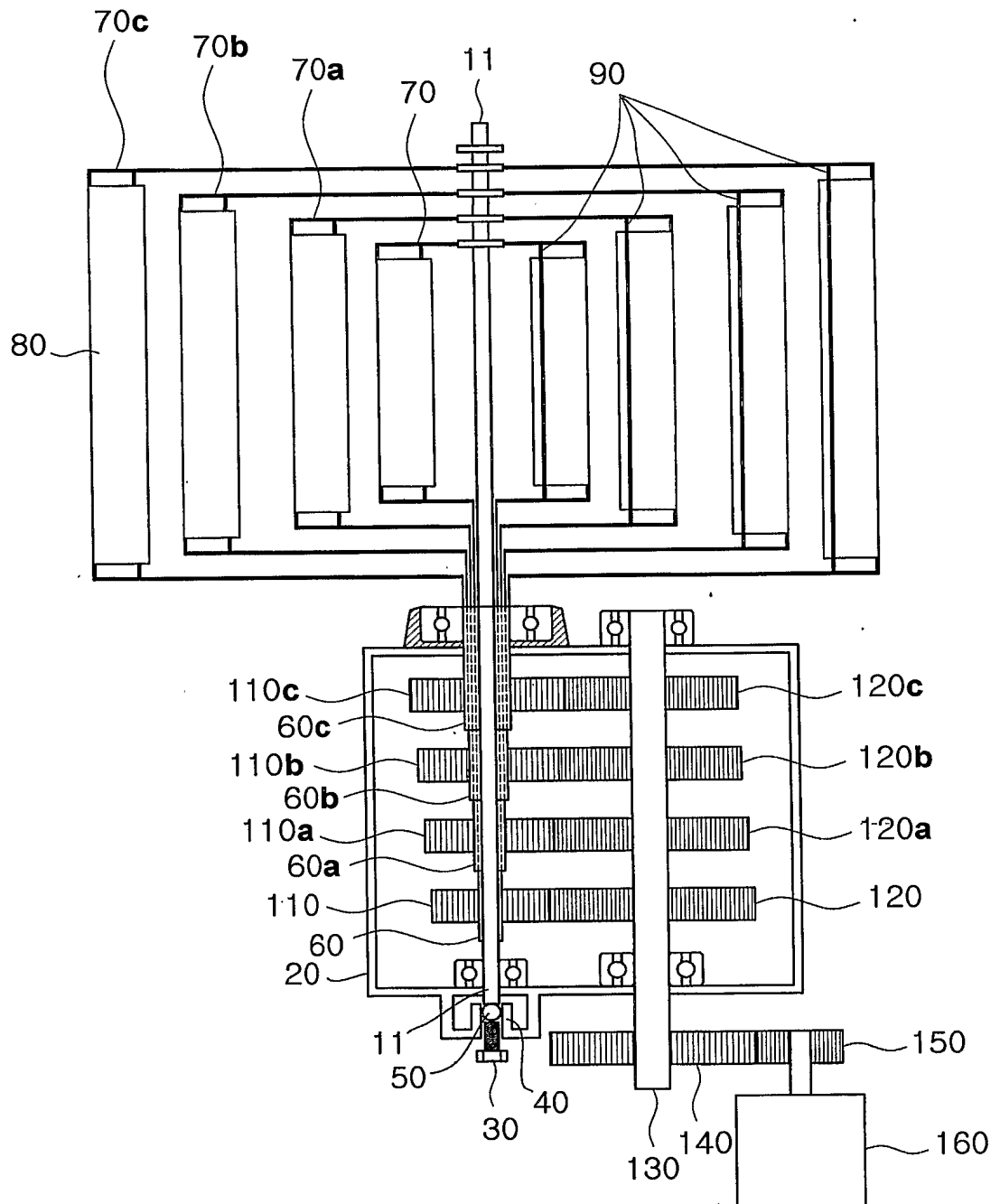
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FIG. 2



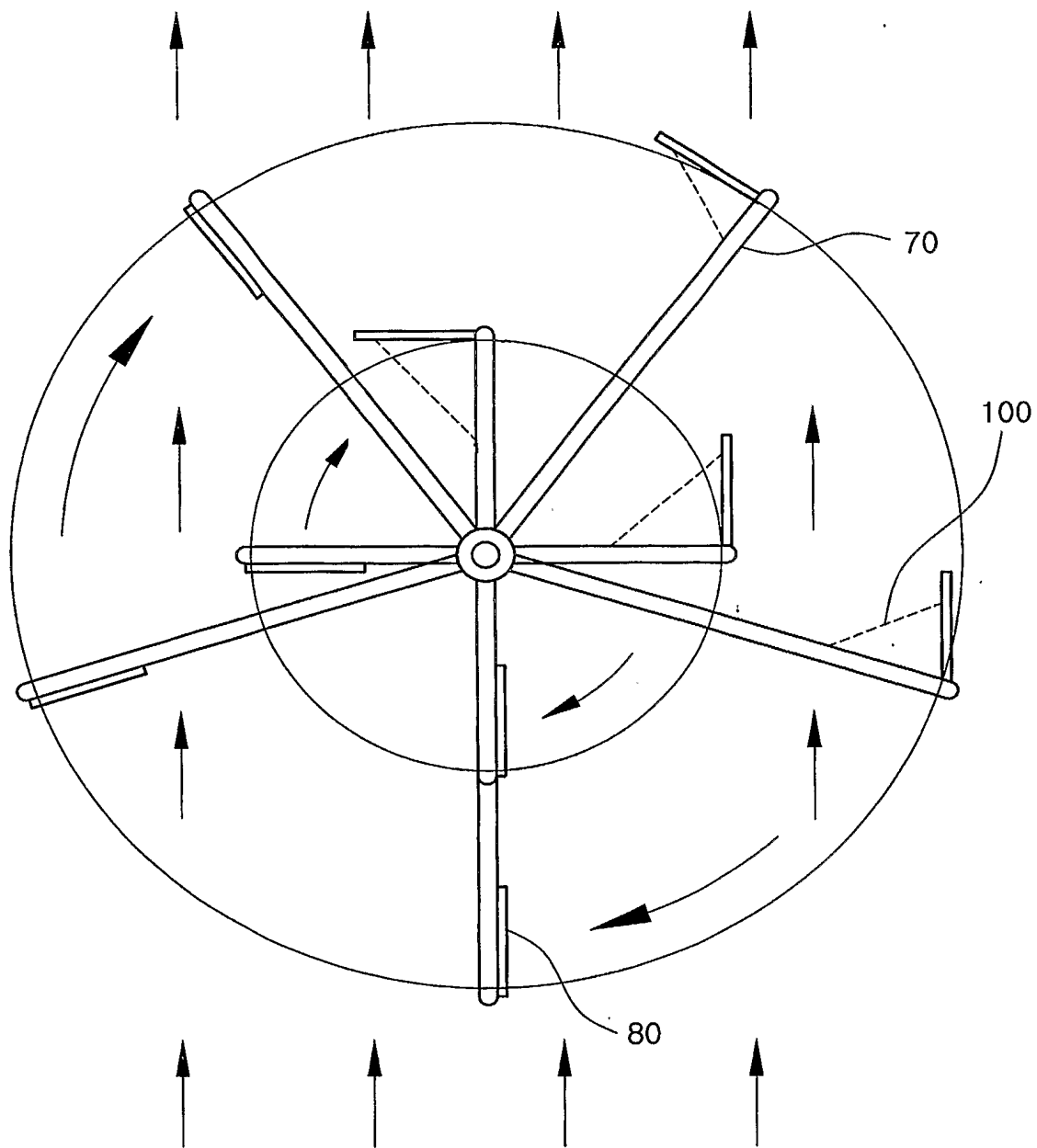
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FIG. 3

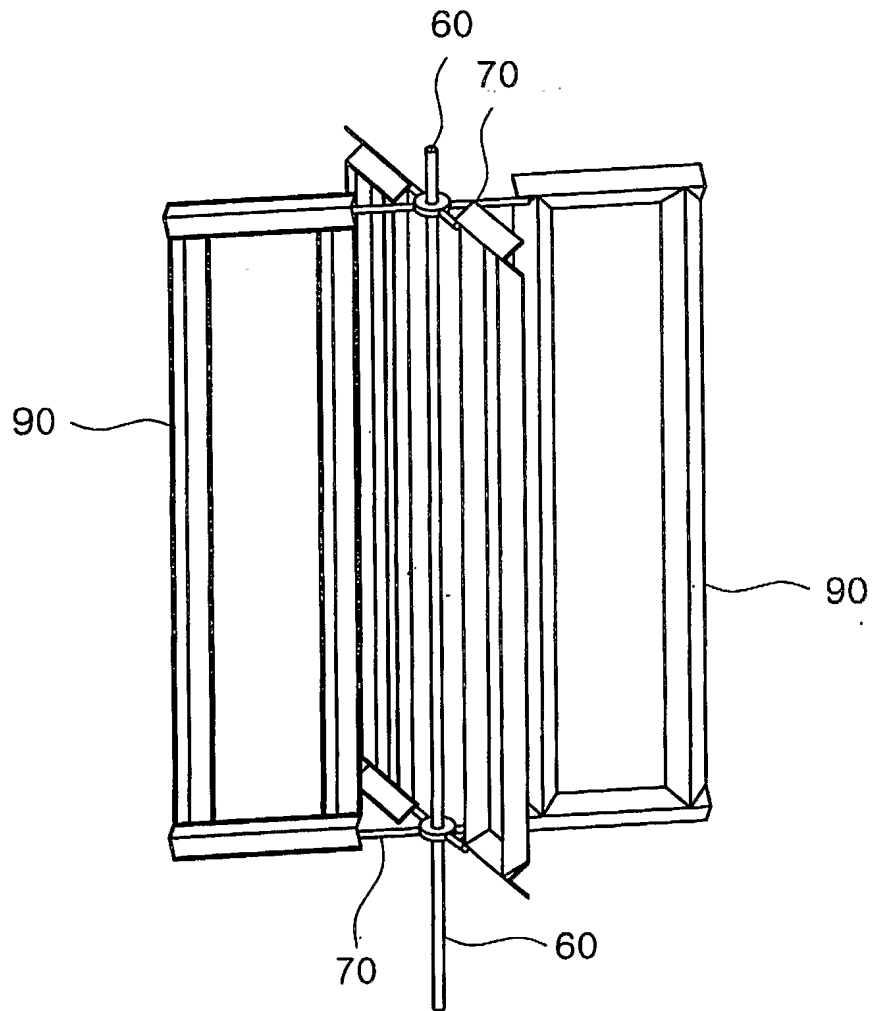


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FIG. 4

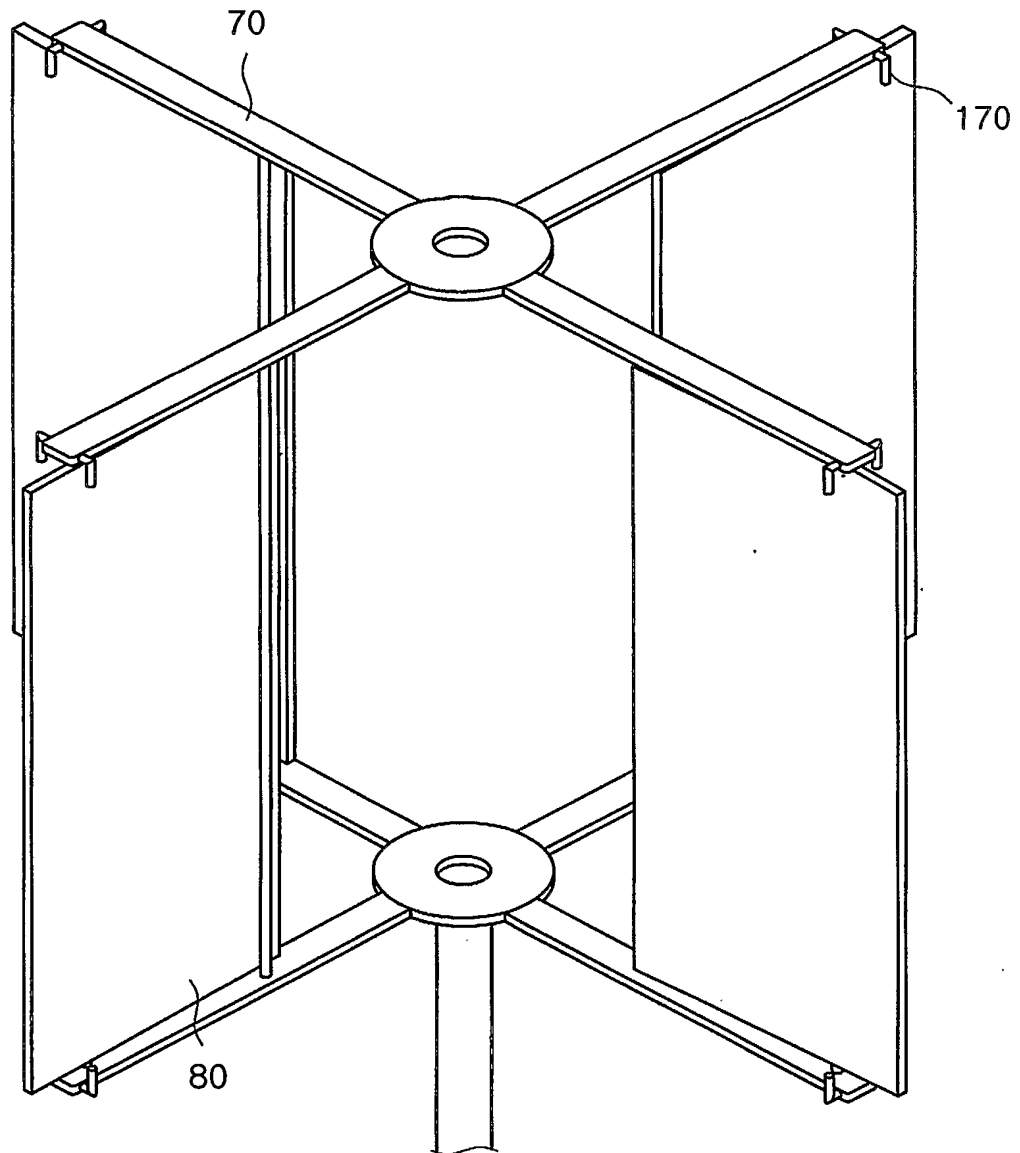


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FIG. 5

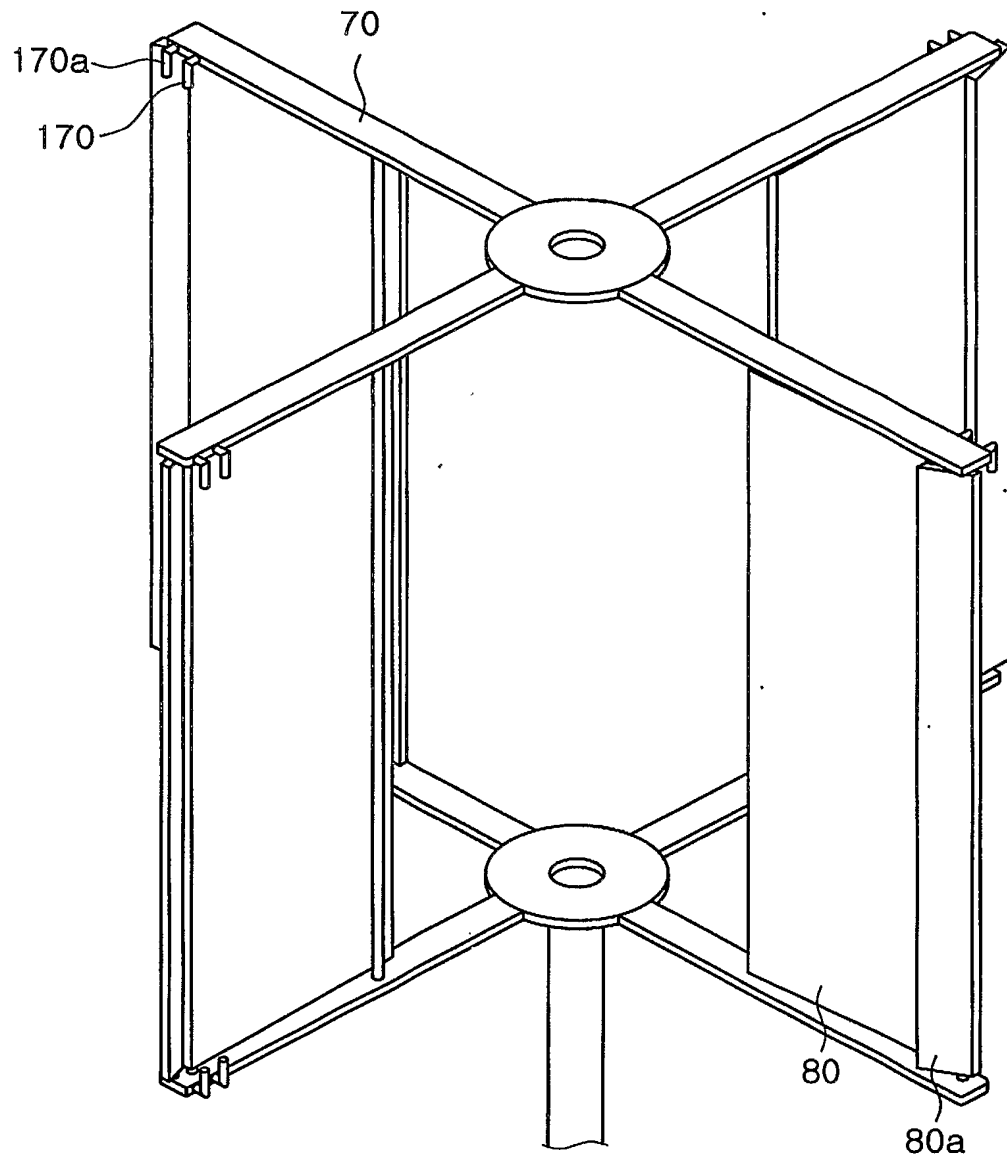


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FIG. 6

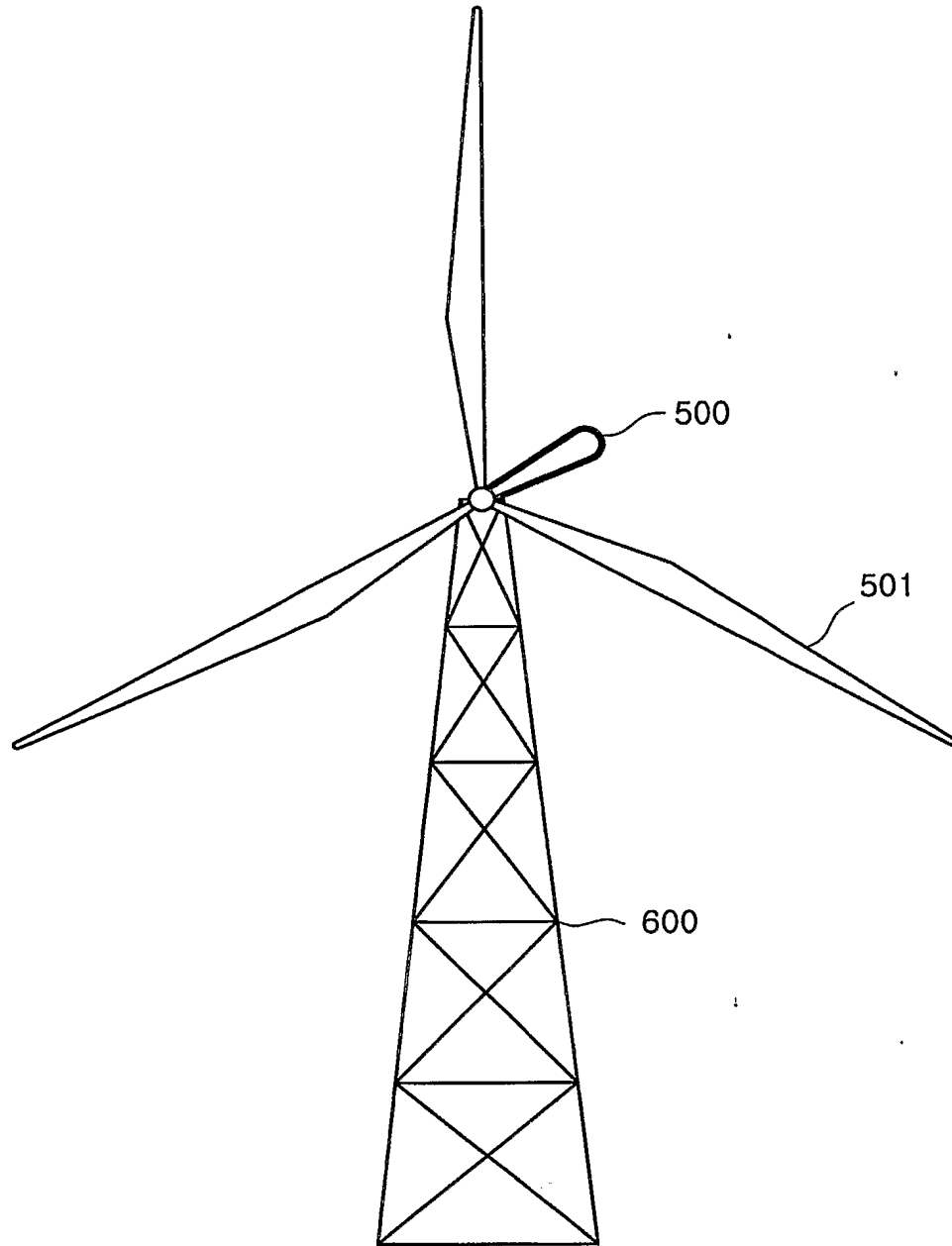


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FIG. 7



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FIG. 8



## INTERNATIONAL SEARCH REPORT

International application No.  
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**A. CLASSIFICATION OF SUBJECT MATTER****IPC7 F03D 3/02**

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 F03D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

KR, JP: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 59-126084 A (Totsuka Tadao) 20 July 1984 See the whole document	1
A	JP 56-132471 A (Ando Naoki) 16 October See the whole document	1 - 3
A	JP 2000-54947 A (Kuno Mitsuomi) 22 February 2000 See the whole document	1 - 3

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